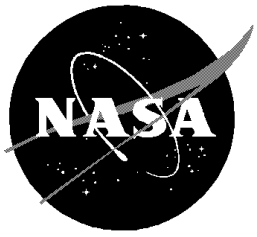
Orbiter Crew Compartment Interface Control Annex

MicroElectroMechanical Systems

Basic
April 1998



National Aeronautics and
Space Administration

Lyndon B. Johnson Space Center
Houston, Texas

DESCRIPTION OF CHANGES TO

ORBITER CREW COMPARTMENT
INTERFACE CONTROL ANNEX

MICROELECTROMECHANICAL SYSTEMS

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NSTS 21424
ICA

ORBITER CREW COMPARTMENT
INTERFACE CONTROL ANNEX

MICROELECTROMECHANICAL SYSTEMS

APRIL 9, 1998

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PREFACE

This document is issued as an Interface Control Annex (ICA) to the Payload Integration Plan (PIP) for the MicroElectroMechanical Systems (MEMS) payload. This ICA describes all MEMS equipment stowed or installed in the Orbiter crew compartment and the pertinent requirements affecting interfaces, stowage, installation, or flightcrew use.

In case of any variation between this ICA and the PIP, the PIP shall take precedence. Any requirements submitted in this document that are not within the scope of the PIP will not be considered binding on the National Aeronautics and Space Administration (NASA) for implementation.

By signing this document the customer is accepting and agreeing to abide by the requirements defined in the following documents unless otherwise specified and/or agreed to in this document.

NSTS-21000-IDD-MDK	Shuttle/Payload Definition Document for Middeck Accommodations
NSTS-21000-ICA	Orbiter Crew Compartment Interface Control Annex Blank Book

The location of equipment defined in this ICA is subject to change by NASA without prior agreement as long as the basic requirements of the payload and integrating hardware are satisfied. Official stowage/installation locations for a given flight will be defined in the appropriate Crew Compartment Configuration Drawing (CCCD).

Any stowage time requirements listed in this ICA are used to assure installation/removal feasibility. Final stowage timelines are the responsibility of the NASA John F. Kennedy Space Center (KSC).

Corrections and updates to this ICA will be made as necessary.

Comments or questions relative to this ICA should be directed to the following:

Space Shuttle Program Representative:

NASA, Lyndon B. Johnson Space Center (JSC)
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CONTENTS

TABLES

FIGURES

1. MIDDECK IDD REQUIREMENTS

The payload will meet all requirements as defined in the Shuttle/Payload Interface Definition Document for Middeck Accommodations, NSTS-21000-IDD-MDK. The customer will be responsible for the following sections of the NSTS-21000-IDD-MDK:

1.0 1.1 1.1.1 1.1.2 1.2 1.2.1 1.3 1.4 1.5		2.0 2.1 2.2 2.3		3.0 3.1 3.1.1 3.2 3.3 3.3.1 3.4 3.4.1 3.4.1.2 3.5 3.6 3.7 3.10		4.0 4.1 4.2 4.3 4.4 4.5 4.6 4.7 4.7.1 4.7.2 4.7.3 4.8 4.8.1 4.9		5.0 5.1 5.2 5.3 5.4

6.0 6.1 6.1.1 6.2 6.2.1 6.2.1.1 6.2.1.3 6.2.1.4 6.2.1.4.1 6.2.2 6.3 6.3.1		7.0 7.1 7.1.1 7.2 7.2.1 7.2.1.1 7.2.1.2 7.2.1.3 7.2.1.4 7.2.2 7.4 7.4.1 7.4.2 7.5 7.5.1		8.0 8.1 8.2 8.2.1 8.2.2 8.3 8.3.1 8.3.2 8.4 8.4.1 8.4.1.1 8.4.1.1.1 8.4.1.1.2 8.4.1.2 8.4.1.2.1 8.4.1.2.1.1 8.4.1.2.3 8.4.1.2.3.1 8.4.2 8.5 8.5.1 8.5.4		9.0 9.1 9.1.1 9.1.2 9.2		

2. PAYLOAD UNIQUE EXCEEDANCES, WAIVERS, DEVIATIONS TO MIDDECK IDD

The payload will meet all requirements as defined in Section 1 above for the Shuttle/Payload Interface Definition Document for Middeck Accommodations, NSTS-21000-IDD-MDK. To support payload review and acceptance, the customer will be required to submit test data for Electromagnetic Compatability (EMC), Thermal, and Acoustic. The test data will be available to Lyndon B. Johnson Space Center (JSC) for review no later than Launch minus 5 (L-5) months. For payload hardware requiring stowage into a locker, the payload is willing to accept the loads transmitted to the hardware by the Orbiter through isolating foam material inside the stowage locker. (Reference NSTS-21000-IDD-MDK, Section 4)

The following are approved exceedances to the middeck Interface Definition Document (IDD):

a. None

3. POWER REQUIREMENTS

Payload power interface characteristics at the Space Shuttle Program (SSP)/payload interface are per Section 7 of the Shuttle/Payload Interface Definition Document for Middeck Accommodations, NSTS-21000-IDD-MDK.

Table 3-1.- PAYLOAD POWER INTERFACE REQUIREMENTS

Orbiter service by flight	IDD ref. par.	Voltage range	Power watts		Time limit on peak power	Payload character-istics
			Max. cont.	Peak		
Prelaunch	7.2.1	24 - 32 V	48	N/A	N/A	N/A
Ascent	7.2.1	24 - 32 V	48	N/A	N/A	N/A
On-orbit	7.2.1	24 - 32 V	48	55	<1 sec	See Note 1
Descent	7.2.1	24 - 32 V	48	N/A	N/A	N/A
Postflight	N/A	N/A	N/A	N/A	N/A	N/A

Note: 1. The power characteristics are such that the MEMS draws a constant current except during on-orbit operations. During on-orbit operations there is a peak power draw due to the activation of the solenoid associated with the doser bottle.

4. PAYLOAD INSTALLATION/STOWAGE/CREW INTERFACE REQUIREMENTS

a. One MicroElectroMechanical System (MEMS) will be installed in an SSP-provided middeck locker with modified locker door with all three panels removed prior to bench review and subsequent shipment to KSC. The MEMS will occupy the entire middeck locker. A back panel will be attached to the inside back of the middeck locker using the six recessed through holes in the back of the locker. The customer-provided fasteners will not protrude past the envelope of the locker. No damage to the SSP-provided locker will result from this procedure. The MEMS will be installed into the Orbiter anytime from L-7 to L-3 days.

b. The MEMS requires 28 V dc power prior to and during ascent, during on-orbit operations, and during descent. Power can be removed for limited amounts of time after concurrence by the customer. A prerouted 28 V dc power cable will be needed for the MEMS. An Interface Verification Test (IVT) will be conducted after the initial installation into the Orbiter.

c. After completion of the IVT, MEMS will be powered off. Power will be returned to the unit by KSC ground personnel prior to ascent.

d. The MEMS has a spare fuse housed within the fuse box on the front face of the unit.

e. Nominal crew activities include throwing a switch on Flight Day 1 (FD1) with subsequent daily status checks for the duration of the mission. Status checks will include confirmation of nominal operation and documentation of a thermal control experiment.

f. MEMS requires the use of data obtained from the nominal air sample taken on-orbit by the crew using the Grab Sampling Container that exists in the Orbiter’s list of core hardware. Note that the Grab Sampling Container listed in Section 5 is not meant to be above and beyond what exists in the Orbiter’s core hardware.

g. Off-nominal crew activities include possible fuse changeout and possible cycling of the power switch.

h. The MEMS requires removal from the middeck and turnover to the customer after landing and prior to Orbiter tow. This requirement is valid for both a KSC or Dryden landing. Best effort is acceptable for Early End of Mission (EEOM) landings.

i. There are no thermal constraints required by the payload which would impact the installation location of the payload.

5. STOWAGE/INSTALLATION HARDWARE DEFINITION

NOMENCLATURE AND P/N	QTY	DIMENSIONS	WEIGHT
SSP-provided equipment:			
Grab Sample Valve Assembly P/N SDD46108778-301	1	See section 4, item f.	N/A
28 V dc power cable P/N 10108-10082-XX	1	See section 6, item e.	TBD
35mm flight camera system P/N TBD	1	N/A documentary photo only	N/A
Middeck stowage locker, with modified access door, with all three panels removed P/N SED39119019-321	1	20.32 in. x 18.125 in. x 10.55 in.	10.5 lb
Payload-provided for dedicated use:			
MEMS back panel P/N DOD60020	1	17.18 in. x 9.76 in. x 2.875 in.	11.0 lb
MEMS Zendex chassis P/N DOD60019	1	16.125 in. x 15.25 in. x 8.5 in.	29.9 lb
MEMS gas sample bottle P/N DOD80044	2	2.5 in. diam X 4.5 in.	0.8 lb ea

6. PAYLOAD ELEMENT STOWAGE/INSTALLATION DESCRIPTION

a. The MEMS stowage design and analysis will be conducted by the payload customer. The final MEMS configuration drawing will be provided to the Crew Compartment Engineer. The MEMS hardware utilizes the entire middeck locker for measurement of accelerations and ambient air characteristics.

b. To support the Flight Crew Bench Review, the Payload Customer will provide the flight hardware to JSC no later than 2 days prior to the review.

c. To support proper installation and stowage assessments, the customer will be required to supply center of gravity (c.g.) data for all hardware being installed in place of a locker or hardware being stowed exceeding 30 lb in weight.

d. The configuration of the MEMS will be similar to the configuration shown in figure 6-1 and the displays & controls as shown in figure 6-2.

e. The dc power cable length, routing for each mission, and exact installation configuration of the MEMS will be defined in the Crew Compartment Configuration Drawing (CCCD)

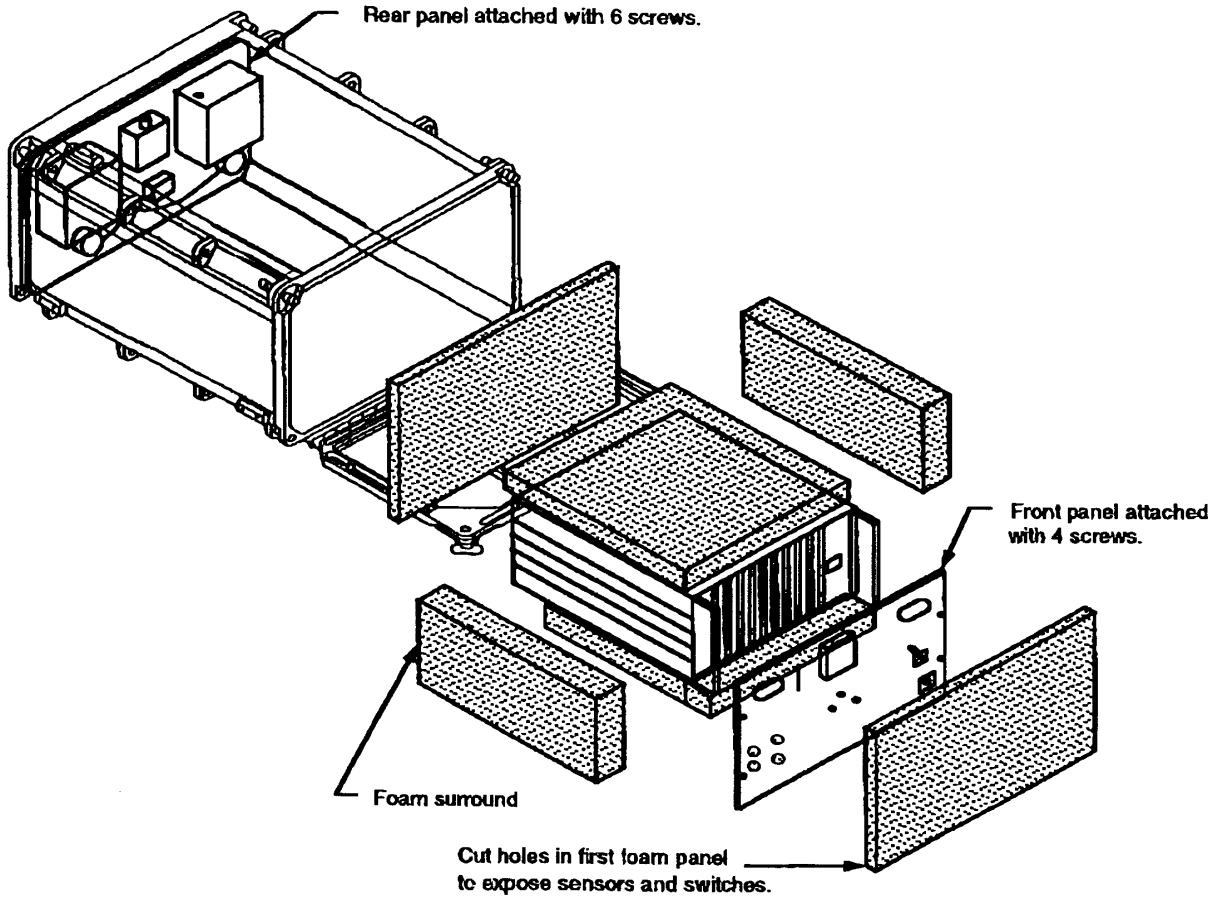

Figure 6-1.- The MEMS configuration.

FRONT PANEL -LABELS

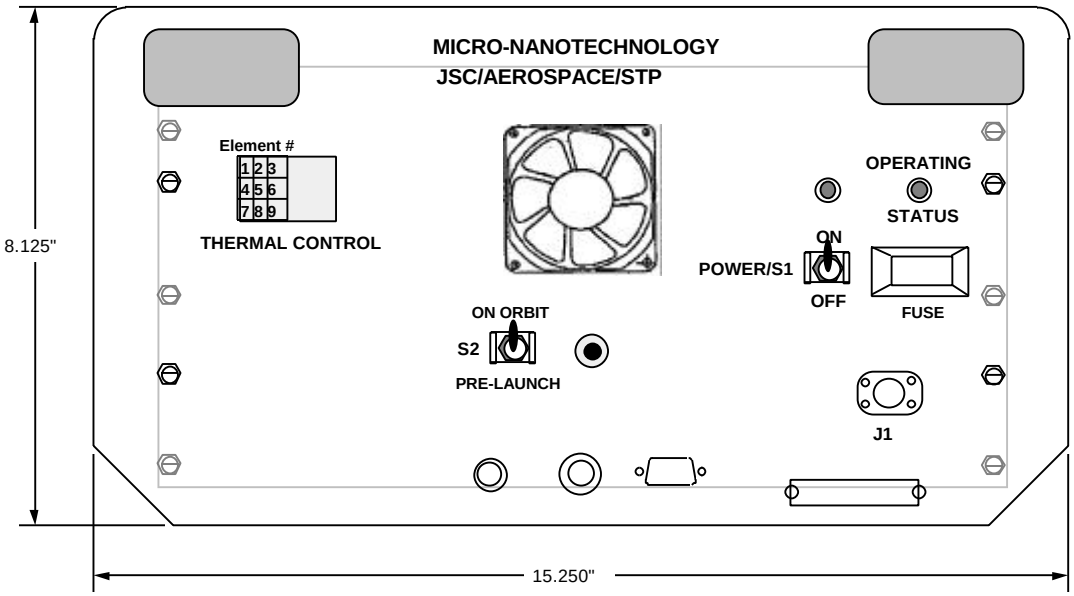

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Figure 6-2.- The MEMS display and controls.

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